Chapter 1: Basic Concepts of Local Watershed Planning

While watershed planning is not new to Maryland, it has historically been conducted by a variety of local, state and private organizations over a range of scales and has featured an array of methods and techniques. The main intent of this guide is to provide a common planning framework for Maryland jurisdictions. Additionally, the purpose of the guide is to:

- define the elements of an effective watershed plan
- assemble all of Maryland's watershed planning resources in one place
- provide practical guidance on how to use watershed planning to meet federal funding requirements and address land use issues
- integrate regulatory drivers and programs such as Total Maximum Daily Loads (TMDL) and the Chesapeake Bay 2000 Agreement with local watershed planning efforts
- describe methods for completing an effective watershed plan within the proposed framework

Local government staff are the primary audience for this guide, however other groups writing watershed plans in Maryland, such as watershed organizations, are also encouraged to utilize the framework.

A. Benefits of Watershed Planning

Local governments across Maryland are finding that their water resources are facing degradation in response to growth and development. They are also discovering that they can only protect local water resources by thinking on a watershed scale. At this scale, local governments can identify specific pollutants and their sources, and create solutions. Watershed planning also provides local governments with a framework to prioritize valuable and sometimes scarce resources such as funding and staff time. Local governments with a good watershed plan in hand will also have access to a greater number of resources for project implementation including Section 319 funds through the Clean Water Act. Additional benefits of watershed planning are outlined in Table 1.1.

Table 1.1: Benefits of Watershed Planning	
Local Government Benefits	*Administrative Benefits*
• Enables analyses that are most meaningful at a watershed or subwatershed scale (e.g., nutrient loadings, impervious cover estimates, etc.) • Enables management at a scale necessary to ensure consistency with TMDLs • Provides a framework for prioritizing resources (staff, conservation dollars, etc.) • Provides educational opportunities for citizens to understand how natural resources management interacts with existing and future development • Gives citizens an active voice in protecting and restoring natural resources that are important to the community	• Provides a structure for communities to target geographic areas for land conservation and development to maximize the efficiency of community planning efforts • Enables more efficient management of permitting programs • Focuses data collection and analysis for environmental assessments • Provides benchmarks for measuring the success of management efforts
Environmental Benefits	*Financial Benefits*
• Improves quality of water for drinking and recreational use • Enhances water supply • Protects wildlife habitat and improves natural resources • Controls flooding by restoring riparian and wetland areas	• Avoids development in sensitive areas and can help minimize compliance and mitigation costs • Improves water supply protection to reduce the need for costly drinking water treatment • Provides a framework and rationale to pursue various funding opportunities • Prevention and planning is less costly than restoration
Source: Modified from CBP, 2004 TMDL: Total Maximum Daily Loads	

B. The Geographic Scale of Watershed Planning

When developing a watershed plan, it is useful to consider what the appropriate geographic scale should be. The largest watershed management unit is the basin. A **basin** drains to a major receiving water such as a large river, estuary or lake. In Maryland, the major drainage basins include the Chesapeake Bay, Ohio River, Delaware River and Coastal Bays. Basin drainage areas typically exceed several thousand square miles and often include major portions of a single state or even a group of states.

Within each basin is a group of **sub-basins** that extend over several hundred square miles. Sub-basins are a mosaic of diverse land uses, including forest, crops, pasture, and urban areas. All or part of 13 sub-basins are located in Maryland, 10 of which fall within the Chesapeake Bay Basin (see Chapter 2 for a map and sub-basin list). The sub-basins that are located in the Chesapeake Bay basin correspond to the Tributary Basins defined by the Maryland Department of Natural Resources (MD DNR) Tributary Strategy Program.

Sub-basins are composed of a group of **watersheds**, which in turn, are composed of a group of **subwatersheds**. Figure 1.1 illustrates these units using a map of all the watersheds and subwatersheds in Howard County. Within subwatersheds are neighborhoods and individual

project sites (see Table 1.2), where individual protection and restoration projects are implemented.

Each method in the watershed planning framework outlined in this guide can be applied to one or more of the five geographic scales outlined in Table 1.2. Additional information regarding watershed scale is provided in Chapter 2.

Watersheds and subwatersheds are the most practical units for preparing local plans. Each watershed is composed of many individual subwatersheds that can have their own unique water resource objectives. A watershed plan is a comprehensive framework for applying management tools within each subwatershed in a manner that also achieves the water resource goals for the watershed as a whole. This guide focuses on the watershed as the primary planning unit, and while certain methods are conducted at the subwatershed scale, others might be more easily conducted at the watershed scale (e.g., stakeholder involvement and drafting the watershed plan). Table 1.3 presents a rationale for conducting specific methods of the watershed planning process at the subwatershed scale.

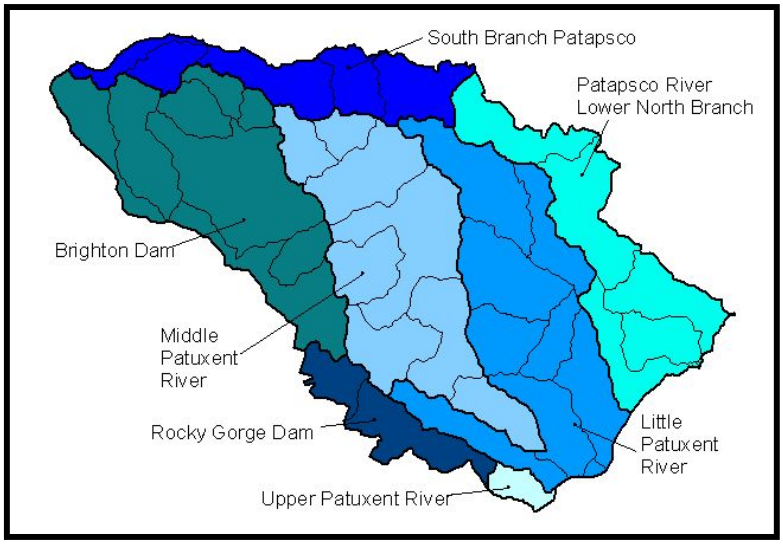


Figure 1.1: Howard County, MD watersheds (labeled) and subwatersheds

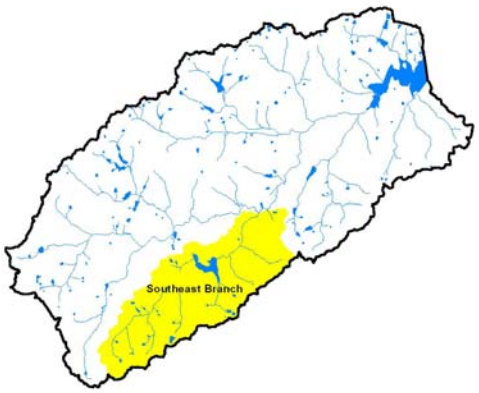
Table 1.2: Geographic Scales of Watershed Planning	
1. Community – Durham County, NC	
Community refers to the entire land area controlled by a single political jurisdiction such as a city, county, village or town. Most communities contain several different watersheds, not all of which may be fully contained within the political boundaries of the community. The community scale is where political decisions to take action on watershed management are made. The map at right shows the county and the location of Little Lick watershed.	
2. Watershed – Little Lick Watershed	
Watersheds consist of land areas that drain to a downstream water body such as a river, lake or estuary. Their total drainage areas range from 20 to 100 square miles, and they often encompass many different land uses and multiple jurisdictions. The watershed scale normally shapes the goals and objectives that drive community watershed planning efforts. They are the primary management unit in the context of this guide and are the focus of watershed plans.	
3. Subwatershed -- Southeast Branch Subwatershed	
Each watershed is composed of many smaller drainage units, known as *subwatersheds*. As a general rule of thumb, subwatersheds drain 10 square miles or less. This is the scale at which more detailed analyses are done as part of a watershed plan.	

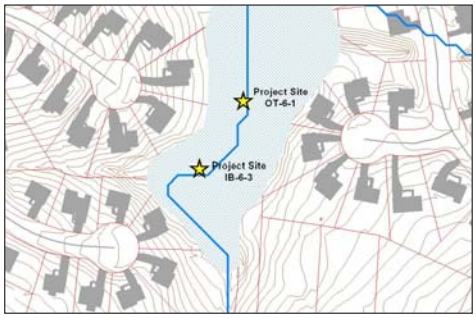
Table 1.2: Geographic Scales of Watershed Planning	
4. Neighborhood -- Lakeridge Corner	
Neighborhoods are an even smaller management unit and are defined as relatively homogenous residential land uses within a subwatershed. Individual neighborhoods have markedly different characteristics and are the locations where protection and restoration projects are implemented. Neighborhoods are also the scale at which community acceptance of these projects is gauged.	
5. Project Site – Sites OT-6-1 and IB-6-3	
The *project site* is the smallest scale for management, and is the location where a single protection or restoration project is implemented. It may be necessary to implement dozens or even hundreds of projects to achieve goals at the watershed scale.	

Table 1.3: Using the Subwatershed Scale in Watershed Planning	
Watershed Planning Method	*Rationale for Conducting at the Subwatershed Scale*
Establish a baseline	The influence of impervious cover on hydrology, water quality, and biodiversity is most evident at the subwatershed scale where the influences of individual development projects are easily recognizable.
Classify and rank subwatersheds	In larger watersheds, the most vulnerable or most restorable subwatersheds should be identified in order to focus limited resources and provide rapid results.
Conduct stream and upland assessments	Locally, managers may prefer the subwatershed as a planning unit because it is small enough to perform monitoring and assessment tasks in a rapid time frame.
Conduct project investigations	
Plan for indicator monitoring	
Estimate pollutant loads and reductions	Subwatersheds are limited in size where few confounding pollutant sources that can confuse management decisions are present (e.g., agricultural runoff, point sources, etc.).
Note that some specific methods or recommendations may be best implemented at the community scale. This may include regulatory and programmatic changes and contiguous forest inventory.	

C. Watershed Planning Terminology

This section introduces some of the basic watershed terms that are at the heart of the watershed planning approach. It is helpful to fully understand these concepts before embarking on a local watershed plan.

- **Watershed plan recommendations** are the most important element of a watershed plan, and generally consist of three parts which are described below: 1) protection and restoration projects, 2) regulatory and programmatic changes, and 3) land use changes and management approaches.

    - **Protection and restoration projects** refer to a suite of site-specific projects that protect and restore watersheds by conserving and enhancing existing watershed resources, or correcting specific problems identified through stream and upland assessments. Protection and restoration projects generally fall into the following categories: stormwater retrofit, stream repair, reforestation, wetland restoration, discharge prevention, pollution source control, municipal operations, sensitive area conservation, and agricultural best management practices (Table 1.4). Some of these projects are structural and require detailed project designs, while others are non-structural in nature.

    - **Regulatory and programmatic changes** are developed in direct response to a review of local codes, ordinances, and programs related to watershed protection. Where local regulations and programs are found lacking, specific changes may be needed. The changes fall into eight general categories: land use planning, land conservation, aquatic buffers, better site design, erosion and sediment control, stormwater management, non-stormwater discharges, and watershed stewardship. Regulatory and programmatic changes are designed to protect watershed resources from future development impacts.

    - **Land use changes and management approaches** are derived from analysis of current and projected subwatershed development based on comprehensive plans and zoning. Land use and impervious cover analyses may indicate that projected changes in land use are incompatible with watershed or subwatershed protection goals or threaten specific sensitive water bodies, and changes are needed in terms of where development will be targeted within an overall watershed planning context. Land use change and management approaches can be accomplished through revisions to county comprehensive plans or area master plans, development of watershed-based functional master plans, and subsequent revisions to local zoning regulations. Other options include overlay zones that apply certain standards to existing land uses, such as transfer of development rights (TDR) programs that transfer development density to more suitable areas.

Table 1.4: Protection and Restoration Projects*	
Project	*Description*
Stormwater Retrofit	Stormwater retrofits are stormwater management measures installed in an urban or ultra-urban landscape where little or no prior stormwater controls existed.
Stream Repair	Stream repair practices enhance the appearance, stability, structure or function of streams.
Reforestation	Pervious area management projects increase tree cover on open lands in upland areas and along the stream corridor, and enhance the quality of remaining forests and wetland.
Discharge Prevention	Discharge prevention projects stop the entry of sewage and other pollutants into the stream.
Pollution Source Control	Pollution source control projects reduce or prevent pollution from residential neighborhoods or stormwater pollutant "hotspots".
Municipal Operations	Municipal operations projects reduce or prevent pollutants from entering the watershed by modifying municipal infrastructure maintenance policies.
Sensitive Areas Conservation	Land conservation projects provide permanent protection from development to sensitive areas (includes contiguous forest, wetlands, and rare, threatened and endangered species).
Agricultural Best Management Practices (BMPs)	Agricultural BMPs refer to a series of techniques that farmers and ranchers can implement to reduce erosion, pollution, water use, and runoff from their land.
** Investigations for each project type are outlined in Chapter 5.*	

- **Stream corridors** include the existing network of stream channels and the lands that surround them.

- **Upland areas** include the remaining watershed area that drains to the stream corridor.

- **Headwater streams** include all first and second order streams in a watershed. A first order stream is a small stream with no tributaries or branches. When two first order streams combine, they form a second order stream. Similarly, when two second order streams join they form a third order stream and so on. Because headwater streams comprise roughly 75% of the total stream and river mileage in a watershed, they are the focus of watershed planning efforts.

- The **core team** refers to the local government staff and/or consultants that actually conduct the watershed planning process.

- **Stakeholders** are defined as any agency, organization or individual involved in or affected by the decisions made in a watershed plan. From a practical standpoint, it helps to think of four broad groups of stakeholders in each watershed planning effort: agencies, the public, watershed partners, and potential funders.

D. The Watershed Planning Process

The watershed planning process generally consists of eight steps, which are illustrated in Figure 1.2 and described below. Each local watershed is unique, with a different combination of impacts, planning objectives, development pressures, stakeholders and local protection capacity. Consequently, watershed planning is always somewhat improvisational, i.e., a unique sequence of planning methods is applied to arrive at the desired outcome. As a result, the order of the methods listed in Table 1.5 is not necessarily the exact order in which they should be conducted; instead, the table summarizes the watershed planning steps and corresponding methods and principles. The principles of watershed planning are discussed in further detail in the next section.

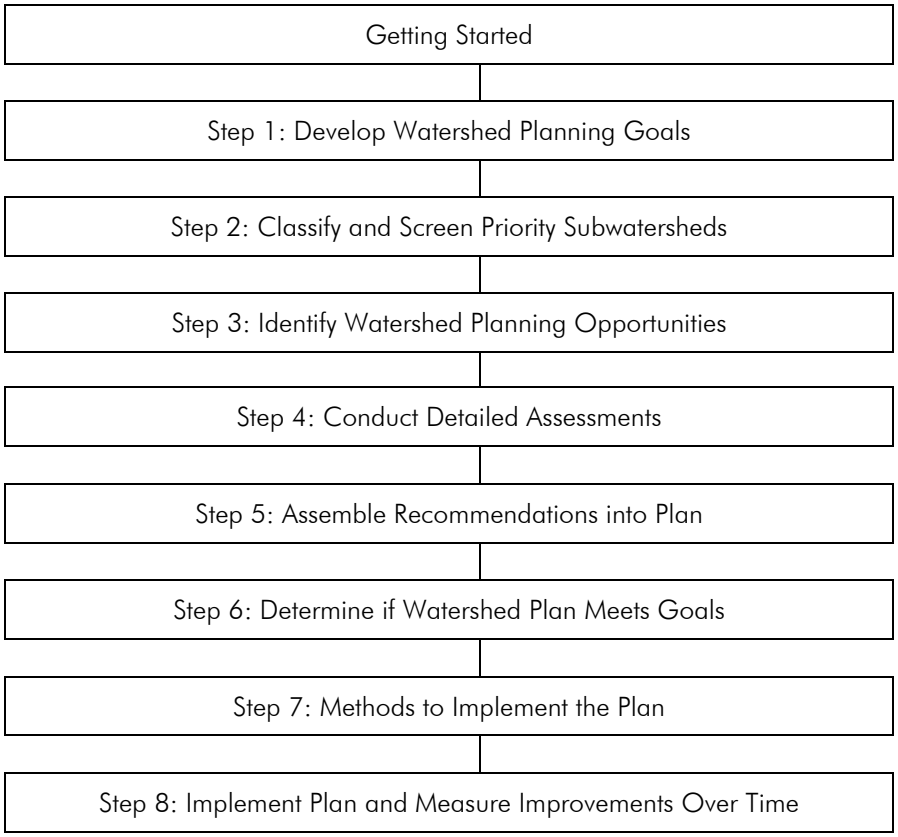


Figure 1.2: The Watershed Planning Process

Table 1.5: Watershed Planning Steps and Corresponding Methods and Principles		
Step	*Corresponding Methods*	*Corresponding Principles of Watershed Planning*[3]
GS[1]	Organize the Core Team	P-1
	Develop a Watershed-Based GIS	P-2
	Gather Existing Watershed Data	P-3
	Delineate Subwatershed Boundaries	P-5
	Develop Initial Goals	P-4
	Develop a Realistic Scope for a Watershed Plan	
	Develop an Overall Stakeholder Involvement Strategy	P-18
1	D: Identify Watershed Needs and Capabilities	P-6
	Establish a Baseline	P-8, P-9, P-10, P-11, P-12
	F: Gather Additional Data[2]	
	S: Recruit Stakeholders	P-18
	Educate Stakeholders	P-18, P-19
	M: N/A	
2	D: Classify and Rank Subwatersheds	P-13
	F: Field Verification[2]	
	S: N/A	
	M: Identify Priority Subwatersheds	P-13
3	D: Evaluate Watershed Programs and Regulations	P-7, P-11
	F: Conduct Stream Corridor Assessments	P-15, P-16
	Conduct Upland Assessments	P-16
	S: Refine Local Vision, Goals and Objectives	P-18
	Manage Stakeholder Meetings	P-18
	M: N/A	
4	D: Develop Project Concept Designs	P-16
	F: Conduct Project Investigations	P-16
	S: Hold Neighborhood Consultation Meetings	P-18
	M: Compile an Inventory of Potential Projects	P-22, P-24
5	D: Rate and Rank Individual Projects	P-14
	F: N/A	
	S: Manage Stakeholders, continued[2]	
	M: Draft the Watershed Plan	P-23, P-25, P-26
6	D: Estimate Pollutant Loads and Reductions	P-10, P-11, P-14, P-24
	F: N/A	
	S: Solicit External Plan Review	P-18
	M: Finalize Watershed Goals, Objectives, and Indicators	P-20, P-21
7	D: N/A	
	F: Plan for Indicator Monitoring	P-17
	S: N/A	
	M: Adopt the Final Plan	P-25, P-26, P-27
8	Implement Plan and Measure Improvements Over Time	

1: Getting Started
2: Methods shown in italics are optional and do not have a corresponding write-up later in the document.
3: Several of the watershed planning principles are listed under multiple methods (e.g., P-18).
Key
D: Desktop Assessment Methods (Chapter 4) ; F: Field Assessment (Chapter 5); S: Stakeholder Involvement Methods (Chapter 6); M: Management Methods (Chapter 7)
N/A: not applicable

Step 1: Develop Watershed Planning Goals
The first step in the watershed planning process analyzes watershed conditions to develop clear consensus among stakeholders on the goals, objectives and indicators that will guide watershed planning. The process starts by examining existing regulatory, programmatic, and scientific information that will influence the planning process. The core team should also consider its local capacity, existing data, and stakeholder concerns when setting goals.

Step 2: Classify and Screen Priority Subwatersheds
Local governments with limited resources may need to target a subset of subwatersheds within the context of a larger watershed. This step is particularly useful in communities that have limited funding for planning and implementation. The core team needs to generally identify the subwatersheds that are the most vulnerable to future development and/or have the greatest restoration potential.

Step 3: Identify Watershed Planning Opportunities
In this step, the core team evaluates current programs and regulations as they pertain to watershed planning and goes out in the field to identify potential protection and/or restoration opportunities. The resulting data is used to develop an initial strategy that scopes out the types of practices that best meet watershed goals.

Step 4: Conduct Detailed Assessments
The purpose of this step is to conduct detailed investigations of candidate projects in the subwatershed. Each candidate site is revisited to acquire more detailed information to work up an initial project design. The core team should also provide neighbors and adjacent landowners an early opportunity to comment on proposed projects and respond to their concerns prior to final design.

Step 5: Assemble Recommendations into Plan
This step transforms the inventory of projects, programmatic changes, and management approaches into a draft plan that recommends the most cost effective group of projects, programs and management approaches for the watershed.

Step 6: Determine if Watershed Plan Meets Goals
This step is perhaps the most frequently overlooked one in the watershed planning process – determining whether or not the plan can meet watershed goals and, if it does, how to ensure that support and funding will be available to implement it.

Step 7: Methods to Implement the Plan
As the watershed plan is being finalized, it is important to step back for a moment and plan for project implementation itself. From here on out, much of the time and expense is devoted to the final design, engineering and permitting of individual projects, programs and management approaches.

Step 8: Implement Plan and Monitor Improvements Over Time
The purpose of Step 8 is to sustain momentum and adapt the plan as more experience is gained in project implementation. It is important to institute tracking and monitoring systems under this step as well.

The watershed planning process can be applied in both watershed restoration and watershed protection scenarios. The core team should take care to note the differences between the two and make appropriate adjustments for local watershed conditions. Some key differences between watershed protection and restoration plans are outlined in Table 1.6.

Table 1.6: Differences Between Restoration and Protection Oriented Watershed Plans*

Parameter	*Protection*	*Restoration*
Watershed Condition	Few stream impacts observed. Meets most water quality standards, good aquatic habitat and biological communities. Lightly developed, and mostly forested or rural, relatively large, intact wetlands.	Impacted conditions. Lots of streams not meeting designated uses. Developed (over 15% impervious cover) or shows signs of significant agricultural impacts (if under 15% impervious cover); flooding problems. Extensive historic and recent wetland losses and floodplain impacts.
Drivers	Special resource protection (e.g., drinking water, trout stream), Tier II waters protected by antidegradation regulations; preventing water quality impairments; endangered species habitat.	Establish TMDLs; NPDES Phase I and Phase II MS4; flooding; public health.
Outcomes	Conserve and protect sensitive areas (e.g., wetlands) through land acquisition or conservation easements; update of local environmental regulations (e.g., stringent stormwater and development criteria, downzoning); revision of comprehensive plan.	Implement TMDL; conserve or restore remaining sensitive area fragments; identify restoration opportunities such as stream repair, IDDE, retrofits, source control, etc.
Scale	Conducted across jurisdictions and in larger watersheds (~100 square miles).	Often needs to be done at subwatershed scale (10 sq. mi. or less) as it is expensive and hard to measure results.
Costs	Low budget; little funding available for implementation; implementation costs reflect land prices, open space management, and cost of code revisions. Creating funding sources possible, such as TDR program and fee-in-lieu systems.	Larger budget; funding opportunities available for implementation, such as stormwater utilities, farm subsidies, restoration grants; can be costly to do assessments, design and permitting, construction, maintenance, and monitoring.
Planning Resources	Smaller jurisdictions may have few staff and planning resources; most plans begin with very little existing data and limited understanding of the nature of current and future impacts. Therefore, the process involves devoting significant effort to desktop and field assessment tasks to establish baseline future impact of development.	Monitoring data and planning resources often available; community has staff, utilities, and GIS capacity.
Stakeholders	Often a few large land owners - private and public; focus on private owner stewardship education; many stakeholders involved perceive that they stand to lose something as a result of greater protections — property rights, higher land development costs, more regulations, and simple changes in the ways things have traditionally been done.	Large number of residents and interest groups; focus stewardship education to target homeowner and business practices which may contribute to pollutants of concern; restoration project implementation will require neighborhood consultation meetings.

** Most watersheds will have some combination of both protection and restoration.*
TMDL: Total Maximum Daily Loads
NPDES: National Pollutant Discharge Elimination System
MS4: Municipal Separate Storm Sewer Systems
IDDE: Illicit Discharge Detection and Elimination
TDR: Transfer of Development Rights

E. Guidance for First Time Watershed Planning Efforts or Small Local Governments

Smaller local governments conducting watershed planning for the first time may lack the resources or expertise to complete an extensive watershed plan. These groups should not be intimidated by the number of methods presented within the User's Guide, as many of them are optional. Selecting the methods needed to complete a watershed plan largely depends on the amount of funding available and purpose of the plan. Small local governments may consider utilizing a consultant to complete the plan. If funding is limited another option may be to complete the plan through a series of grants over several funding cycles.

Communities just getting started should also review the Chesapeake Bay Program's Community Watershed Assessment Handbook which was developed to assist communities with gathering and evaluating information prior to developing the watershed plan itself. It is available online: www.chesapeakebay.net/pubs/watershed_assess/

Table 1.7 lists the essential methods recommended for first time watershed planning efforts. In addition to Table 1.7, two additional methods are necessary to comply with Environmental Protection Agency's (EPA) Watershed Plan Guidance Elements: "Estimate Pollutant Loads and Reductions" and "Plan for Indicator Monitoring." For more information on these methods, consults Chapters 4 and 5, respectively. Compliance with EPA's elements is necessary for watershed plans that are developed or implemented with EPA Section 319 funds. More information on EPA's Guidance Elements is provided in Chapter 2.

Table 1.7: Essential User's Guide Methods

Step	*Watershed Planning Methods*
GS	• Gather Existing Watershed Data • Develop Initial Goals • Develop a Realistic Scope for a Watershed Plan • Develop an Overall Stakeholder Involvement Strategy
1	• Establish a Baseline • Recruit Stakeholders • Educate Stakeholders
2	N/A
3	• Evaluate Watershed Programs and Regulations • Conduct Stream Corridor Assessments • Manage Stakeholder Meetings
4	Compile an Inventory of Potential Projects
5	Draft the Watershed Plan
6	Finalize Watershed Goals, Objectives, and Indicators
7	Adopt the Final Plan

F. Principles of Watershed Planning in Maryland

Several key ingredients need to be addressed in a watershed plan for effective and successful implementation. These include current regulations and requirements that require inclusion in local watershed plans to qualify for funding or to meet federal and state water quality criteria. To that end, 27 watershed planning principles are presented in this guide. These principles, outlined below, define the elements that comprise an effective and meaningful watershed plan and integrate all of the drivers and programs such as TMDLs and the Chesapeake 2000 Agreement, as illustrated in Chapter 2. (Note that the "P-#" presented below represents the principle number and is not a page number reference.)

A local watershed plan should:

Getting Started

P-1 Plan Management: Identify the core team and ongoing management structure that will oversee plan implementation and tracking, and indicate how stakeholders and partners will be involved.

P-2 Watershed GIS: Utilize a watershed-based GIS as the primary tool to store, organize and analyze all watershed data generated throughout the watershed planning process.

P-3 Existing Data: Gather existing watershed data. At a minimum, the data should include the watershed boundary, Maryland tributary basin, 303(d) listings, designated uses, and show State water quality monitoring stations. Existing data should also be utilized in the development of initial goals.

P-4 Pollutants of Concern: Specifically target one or more pollutants of concern. Nutrients will be the default pollutant of concern, but other pollutants may be added if the water body is listed for non-attainment of other chemical, physical or biological standards on the 303(d) list.

P-5 Subwatershed Delineation: Delineate and analyze the subwatersheds that comprise watershed, and conduct planning and management at that scale.

Desktop Assessment Methods

P-6 Local Capacity: Assess the capacity of existing local programs to protect and/or restore water resources.

P-7 Programmatic Change: Identify specific changes in local programs, codes, ordinances and development review that will be considered as part of the plan.

P-8 Baseline Analysis: Establish a watershed baseline by summarizing watershed characteristics, analyzing land use and impervious cover data, reviewing existing monitoring data, and evaluating sensitive areas.

P-9 Land Use Projections: Contain projections of future land cover in each subwatershed that corresponds to the local comprehensive plan.

P-10 Designated Uses: Explicitly consider how future land use change will influence designated uses and affect future loadings of the pollutant of concern including stressors that degrade biological integrity.

P-11 Comprehensive Plan: Explicitly consider land use changes and management approaches to current zoning, comprehensive plans, water and sewer and subdivision decisions that may be needed to maintain designated uses. This consideration should include simple nutrient load estimations that account for future growth implications of these planning tools to ensure that consistency with existing TMDLs or does not increase relative to an impairment on the 303(d) list for which a TMDL has yet to be completed.

P-12 Development Capacity Analysis: Conduct an analysis of future development capacity to ensure that future growth projections can be met under current zoning, development densities, and water and sewerage plans.

P-13 Subwatershed Metrics: Utilize impervious cover and other subwatershed metrics to identify the subwatersheds most vulnerable to future development, and/or restorable.

P-14 Pollutant Reduction: Document the expected reduction in the pollutants of concern as a result of plan implementation using spreadsheet or simulation models and pollutant removal efficiencies consistent with state and Bay program methods. Cost and pollutant removal estimates should be provided for each project where feasible.

Field Assessment Methods

P-15 Field Verification: Verify and refine desktop assessment assumptions in the field (such as current impervious cover classifications).

P-16 Field Assessments: Investigate potential protection and restoration projects in both the stream corridor and upland areas.

P-17 Environmental Indicators: Indicate the environmental indicators that will be used to track progress toward watershed goals. As a default, the plan shall tie into existing State and MBSS monitoring stations located within the watershed.

Stakeholder Involvement Methods

P-18 Stakeholder Involvement: Include meaningful stakeholder involvement throughout the entire planning process, including goal setting, plan development and external review.

P-19 Watershed Education: Document methods used to educate residents and increase watershed awareness.

Management Methods

P-20 Goals, Objectives and Indicators: Include measurable goals, objectives and indicators that are developed based on pollutants of concern, resources of concern, data from the sensitive areas analysis, future land use changes, current and future stream quality and stakeholder input.

P-21 Consistency: Be consistent with regulatory drivers and agreements such as the Chesapeake Bay Agreement, tributary strategies, source water protection plans, municipal NPDES Phase I or II MS4 permits and TMDLs (e.g., water quality standards, limit on load stressors, and control actions to achieve loading limits).

P-22 Recommendations: Identify specific short and long-term recommendations, with implementation phased over a five year period.

P-23 Implementation Planning Table: Include an implementation planning table that identifies the objective, responsible party, measurable indicator, public involvement, programmatic change, estimated cost, potential funding sources, and implementation timeframe for each recommendation. The table should ultimately be used to track the status of plan implementation over time.

P-24 Implementation Units: Express implementation efforts in common units used by the Chesapeake Bay Program's Watershed Model (e.g., stream miles fenced, acres reforested, etc.).

P-25 Plan Financing: Indicate the specific private, local, state and federal funding sources needed to finance plan implementation.

P-26 Adoption Mechanism: Outline a plan for adoption by the local government. The plan can be adopted in a number of ways including: adopted as an element of the comprehensive plan, commitment of funds for implementation, formal endorsement of the watershed plan goals by elected officials, and formal adoption of the entire plan. The precise vehicle for plan adoption will be different in each community.

P-27 Revisit Plan: Indicate the mechanism for revisiting and updating the plan and reviewing progress on a regular cycle.

Incentives for Adhering to the Principles

These 27 Watershed Planning Principles are intended to define the elements that make up a holistic and effective watershed plan. Additionally, compliance with the principles will help local governments meet multiple regulatory requirements (see Chapter 2 for additional details) and leverage funding for project implementation (e.g., stream repair or contiguous forest conservation). This framework provides consistency to the myriad of watershed related requirements and promotes the consolidation of efforts and reports into one plan. Other incentives may exist internally at the local level and may include response to citizen concerns (tree loss due to erosion along streams) and implementation of community goals (tree retention, recreation, neighborhood revitalization, etc.).

G. How to Use this Guide

The remaining chapters in this guide present the background for watershed planning in Maryland and the methods needed to complete each step in the watershed planning process. Watershed planning is always somewhat improvisational, i.e., a unique sequence of planning methods is applied to arrive at the desired outcome. As a result, the order of the methods presented throughout this guide is not necessarily the exact order in which they should be conducted. The remainder of the guide is organized as follows:

Local governments and other watershed planners are encouraged to adapt and modify the methods presented in the remaining chapters to suit the unique conditions present in their community.

Chapter 2: *The Context for Watershed Planning in the State of Maryland* - provides some background on Maryland's watersheds, explains how watershed planning can meet the requirements of specific regulatory drivers in Maryland, and summarizes other key programmatic resources.

Chapter 3: *Getting Started* - outlines how to organize local efforts to support assessment, planning and implementation prior to receiving funding for a watershed plan.

Chapter 4: *Desktop Assessment Methods* – explains the methods that occur in the office and are used to organize, map and interpret subwatershed information to make better watershed planning decisions.

Chapter 5: *Field Assessment Methods* – summarizes the methods that take place in the stream corridor and subwatershed that are used to rapidly identify, design and rank restoration practices and conservation sites, and/or monitor improvements in stream quality.

Chapter 6: *Stakeholder Involvement Methods* – discusses the methods that are used to identify, recruit and structure the involvement of a diverse group of stakeholders during each step of the planning process.

Chapter 7: *Management Methods* – reviews the methods that develop products or processes that help agencies, partners and stakeholders agree on key watershed planning decisions.

Throughout this guide, the icon shown to the left is used to denote which watershed planning principle(s) line up with each method. The icons include the number and short principle descriptor and can be used to quickly locate where specific principles are addressed throughout the guide.

The primary format of the guide is web-based. This allows for frequent updates and revisions and provides users with easy access to the most up-to-date information. With this in mind, downloadable tools are provided in lieu of appendices. The User's Guide tools referenced throughout the guide are summarized in Table 1.7 and are available for download from MD DNR's website (www.dnr.maryland.gov)

Table 1.8: User's Guide Downloadable Tools	
Tool No.	*Title*
1	Maryland Contact and Website List
2	Maryland GIS Resources
3	Maryland Monitoring Resources
4	Funding Resources
5	Relevant State Programs, Requirements and Resources
6	Model Scope of Works for Watershed Plans
7	Estimated Scoping and Practice Costs
8	Needs and Capabilities Assessment (NCA)
9	Smart Watersheds Benchmarking Tool
10	MDP's Models and Guidelines: Estimating Residential Development Capacity
11	Leaf Out Analysis
12	Watershed Vulnerability Analysis
13	Comparative Subwatershed Analysis (CSA)
14	Assessing Local Watershed Protection Programs and Regulations: The Eight Tools Audit
15	Modeling Resources
16	Watershed Treatment Model (WTM)
17	Continuous Stream Walk Assessment Methods Field Sheets
18	Unified Subwatershed Site Reconnaissance (USSR) Field Sheets
19	• Candidate Project Investigation Field Sheets: • Retrofit Reconnaissance Inventory (RRI) Field Sheets • Stream Repair Investigation (SRI) Field Sheets • Urban Reforestation Site Assessment (URSA) Field Sheets • Discharge Prevention Investigation (DPI) Field Sheets • Sensitive Areas Assessment Field Sheets – Contiguous Forest Assessment – Rare, Threatened, and Endangered Species Assessment – Links to Additional Sensitive Area Assessments
20	Stakeholder Involvement Profile Sheets
21	Stakeholder Education Resources
22	Management Profile Sheets